REMARKS

Claims 1-13, 16-31, 33-36, 38-42, and 51-53 are currently pending.

1. Claims 1-13, 16, 17, 21, 23-31, 33-36, 38, 40-42 and 51-53 were rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,391,442 (herein referred to "Duvall") in view of WO 03/004580 (herein referred to as "Yamazaki"). Applicants respectfully traverse this rejection.

Claim 1 recites a thermal interface material including a polymer component, a phase change component and greater than about 7% by weight of a nonionic surfactant. Claim 25 is directed to a thermal interface material including a phase change wax and greater than about 7% by weight of a nonionic surfactant. Claim 36 recites a thermal interface tape having a first layer including a conductive film and having a second layer including a thermal interface material recited in claim 25. Claim 53 recites a thermal interface material including a phase change wax and greater than about 7% by weight of a surfactant.

Claim 42 is directed to a microelectronic structure including an integrated circuit active device, a heat sink, and a thermal interface tape disposed between the device and the heat sink. The thermal interface tape includes a phase change component and greater than about 7% by weight of a nonionic surfactant.

The PTO appears to rely on Duvall as teaching a thermal interface material disposed between a heat sink and a heat source. Duvall discloses a thermal interface material that includes thermally conductive filler particles and a phase change material. The phase change material includes a polymer component and a melting point (phase change) component, which adjust the softening temperature of the phase change material. The PTO correctly acknowledges that Duvall does not teach at least 7wt% of a nonionic surfactant. As such, the PTO appears to turn to Yamazaki.

Yamazaki teaches a thermally conductive composition including (a) 100 parts by weight of a wax, (b) 10 to 1,000 parts by weight of a compound of formula (I), (c) 10 to 2,000 parts by weight of a thermoconductive filler and (d) 0 to 1,000 parts by weight of a softener. Further, Yamazaki states that an example of a synthetic wax includes stearic amide. The PTO appears to rely on Yamazaki disclosure that a synthetic wax may include stearic amide to overcome the deficiencies of Duvall, stating that it would have obvious to utilize a fatty acid amide in a blend with the wax taught in Duvall. That is, the PTO has argued that it would have been obvious to *partially replace* the wax of Duvall with a fatty acid amide. The PTO further asserts that the motivation for the combination would have been that said fatty acid amide is functionally equivalent to the wax taught by Duvall.

Foremost, even assuming that the references teach functional equivalency of the phase change wax of Duvall and the fatty acid amide of Yamazaki, the references provide absolutely no motivation to make the substitution advocated by the PTO. Moreover, the references do not suggest a partial substitution, let alone a partial substitution to contain at least 7% by non-ionic surfactant. In this respect, applicants have discovered that the *combination* of nonionic surfactant (at least 7% by weight) and a phase change component in the context of thermal interface materials provides notable technical advantages. Specifically, Applicants discovered that the combination of the claimed nonionic surfactant in an amount of at least 7% by weight and phase change components provides both improved peel strength and reduced thermal impedance. In particular, Applicants have discovered the combination leads to significant increases in peel strength, as illustrated in examples 1-5, which is advantageous in thermal interface tape embodiments. Furthermore, comparative testing with example 6 (free of surfactant) shows that embodiments of the claimed invention provide notably reduced thermal impedence.

At best, the art suggests interchangeability or equivalency of the non-ionic surfactant and phase change wax, and nowhere suggests that their combination would result in material property enhancements. Applicants submit that the improvements in mechanical properties (peel strength) and thermal properties (thermal impedence) clearly demonstrate technical significance of the claimed invention and are indicative of the nonobviousness of the claimed invention.

For at least the forgoing reasons, Applicants respectfully submit that claims 1-13, 16, 17, 21, 23-31, 33-36, 38, 40-42 and 51-53 are patentable over Duvall in view of Yamazaki.

Accordingly, reconsideration of withdrawal of the 35 U.S.C. 103(a) rejection are respectfully requested.

2. Claims 1-13, 16-31, 33-36, 38-42, and 51-53 were rejected under 35 U.S.C. 103(a) as being unpatentable over Duvall in view of EP 0 794 227 (herein referred to as "Hill"). Applicants respectfully traverse this rejection.

The PTO appears to rely on Duvall as teaching a thermal interface material including a polymer component and a phase change component. The PTO correctly acknowledges that Duvall does not teach at least 7% by weight of a nonionic surfactant. Accordingly, the PTO appears to turn to Hill.

Hill appears to disclose a molding compound including a polymer based material, a filler; and a nonionic surfactant. The filler includes boron nitride and the nonionic surfactant is selected from a class consisting of carboxylic acid amide and carboxylic acid esters. In general, the teachings of Hill are primarily directed to use of the minimum necessary non-ionic surfactant to achieve dispersion of filler. In contrast, the claimed invention focuses on use of a non-ionic surfactant to improve properties of the thermal interface material, apart from dispersion of filler.

More particularly, Hill states that a Sorbitan Monostearate surfactant was added into compositions at increments of 1 to 5% by weight of the BN to determine its effect on spiral flow and thermal conductivity (Hill, pg. 3, ll.22-23). Hill also states that "it is apparent that the benefit of a nonionic surfactant is cumulative to that realized from using a boron nitride filler within a narrow concentration range for the surfactant of between 1 to 4.5% (Hill, pg. 3, ll.34-35)." In each of the examples 1-3, Hill discloses using less than 5% by weight surfactant based on the weight of the BN filler and not greater than 70% by weight of the filler is used in the molding compound. As such, Hill fails to teach use of a nonionic surfactant in amounts greater than about 5% by weight (actually, Hill teaches a max of 3.5% by weight). To one of ordinary skill in the art, Hill teaches use of not greater than 4.5% by weight of the filler and in fact, teaches a way from using amounts greater than 4.5wt% based on the weight of the filler by advocating a "narrow concentration range." As such, the combination of Duvall and Hill fails to teach or remotely suggest greater than about 7% by weight of a nonionic surfactant mixed with the polymer component and the phase change component.

Further, as stated above, Applicants have discovered that the combination of nonionic surfactant in an amount greater than 7% by weight with the phase change component in the context of thermal interface materials provides notable technical advantages, in the form of improved thermal and mechanical properties. Such advantages are nowhere suggested by the references, and are further indicia of the nonobviousness of the claimed invention.

For at least the foregoing reasons, Applicants respectfully submit that claims 1-13, 16-31, 33-36, 38-42, and 51-53 are patentable over Duvall in view of Hill. Accordingly, reconsideration and withdrawal of the 35 U.S.C. 103(a) rejection are respectfully requested.

3. Claims 1, 2, 6, 7, 10-13, 16-23, 25, 27, 28, 30, 31, 33-36, 38-42, and 51-53 were rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6,054,198 (herein referred to as "Bunyan") in view of Hill. Applicants respectfully traverse this rejection.

Bunyan discloses a thermally conductive interface formed as a self supporting layer of a thermally conductive material, which has a transition temperature between two phases. Bunyan teaches that conventional wetting, opacifying, or anti-foaming agents, pigments, flame retardants, and antioxidants also may be added to the formulation depending upon the requirements of the particular application envisioned. The PTO correctly acknowledges that Bunyan does not teach a surfactant. Accordingly, the PTO appears to turn to Hill.

For the reasons stated above, Hill does not fairly teach or suggest to one of ordinary skill in the art use of a nonionic surfactant in an amount greater than 7% by weight, let alone the advantages associated with the use of the combination of nonionic surfactant in an amount greater than 7% by weight with a phase change component in the context of a thermal interface material. As such, the combination of Bunyan in view of Hill is deficient.

For at least the foregoing reasons Applicants respectfully submit that claims 1, 2, 6, 7, 10-13, 16-23, 25, 27, 28, 30, 31, 33-36, 38-42, and 51-53 are patentable over Bunyan in view of Hill. Accordingly, reconsideration and withdrawal of the 35 U.S.C. 103(a) rejection are respectfully requested.

Applicants respectfully submit that the present application is now in condition for allowance. Accordingly, the Examiner is requested to issue a Notice of Allowance for all pending claims.

Should the Examiner deem that any further action by the Applicants would be desirable for placing this application in even better condition for issue, the Examiner is requested to contact Applicants' undersigned attorney or agent at the number listed below.

Applicants do not believe that any additional fees are due, but if the Commissioner believes additional fees are due, the Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 50-3797.

Respectfully submitted,

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Date

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